

Lesson 2

Whole Farm Nutrient Planning



Adapted by Robert Flynn from Rick Koelsch, University of Nebraska

Livestock and Poultry Environmental Stewardship



Why the Focus on Nutrients?



Water Quality Contaminants in Manure

**Possible
Pollutants**

**Environmental
Risk**

***What are the
top 5 components of manure
that may cause
water quality problems?***



Water Quality Contaminants in Manure

Possible Pollutants	Environmental Risk
1) <i>Nitrate-N</i>	<i>Health</i>
2) <i>Ammonia-N</i>	<i>Fish Kills</i>
3) <i>Phosphorus</i>	<i>Eutrophication</i>
4) Pathogens	Health
5) Organic Matter	Oxygen Depletion



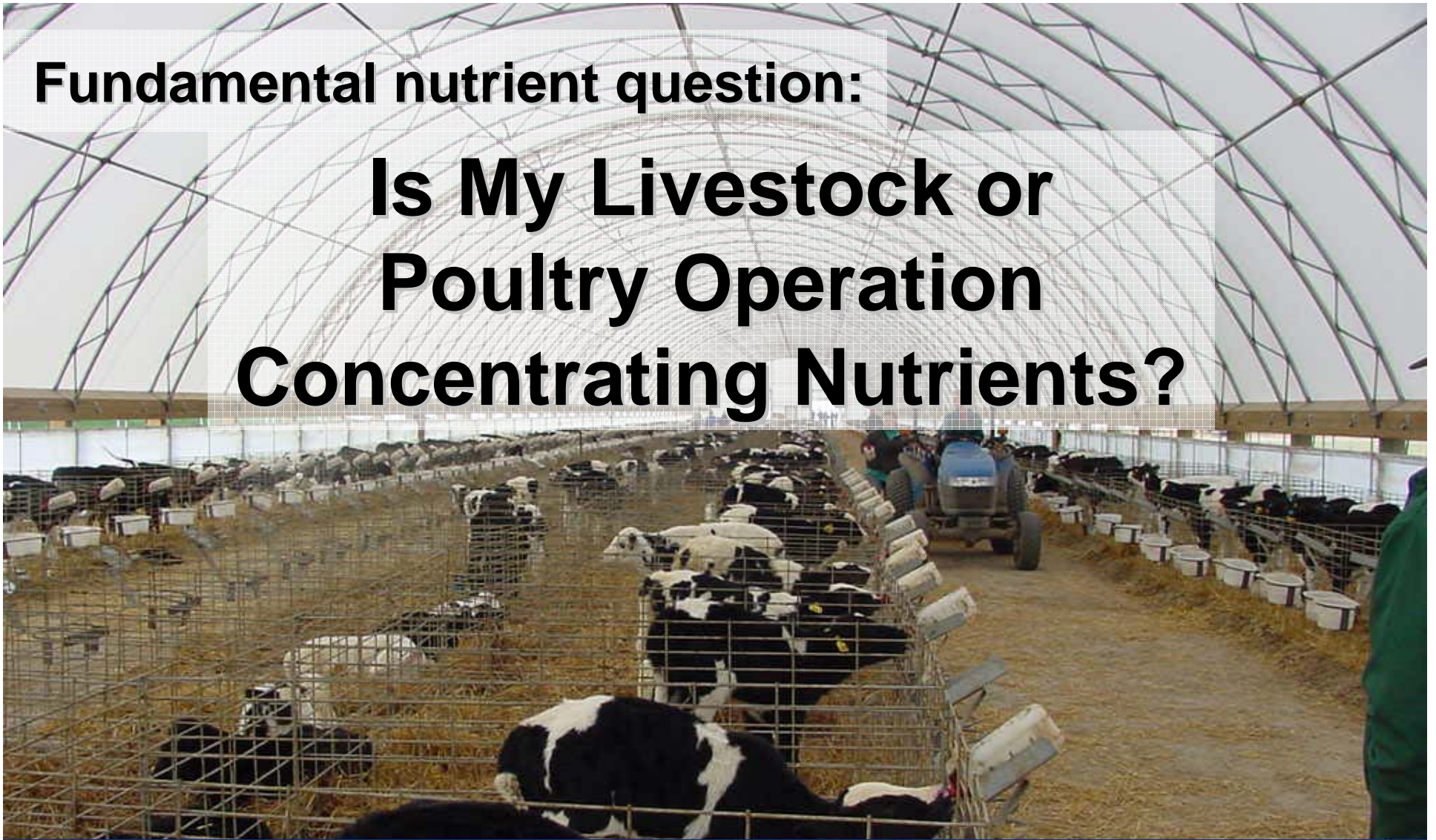
Lesson Objectives

- Define “Whole Farm” nutrient balance for animal feeding operations
- Is “Whole Farm” nutrient imbalance an issue for my animal operation?
- Identify solutions to a “Whole Farm” nutrient imbalance.



Fundamental nutrient question:

Is My Livestock or Poultry Operation Concentrating Nutrients?

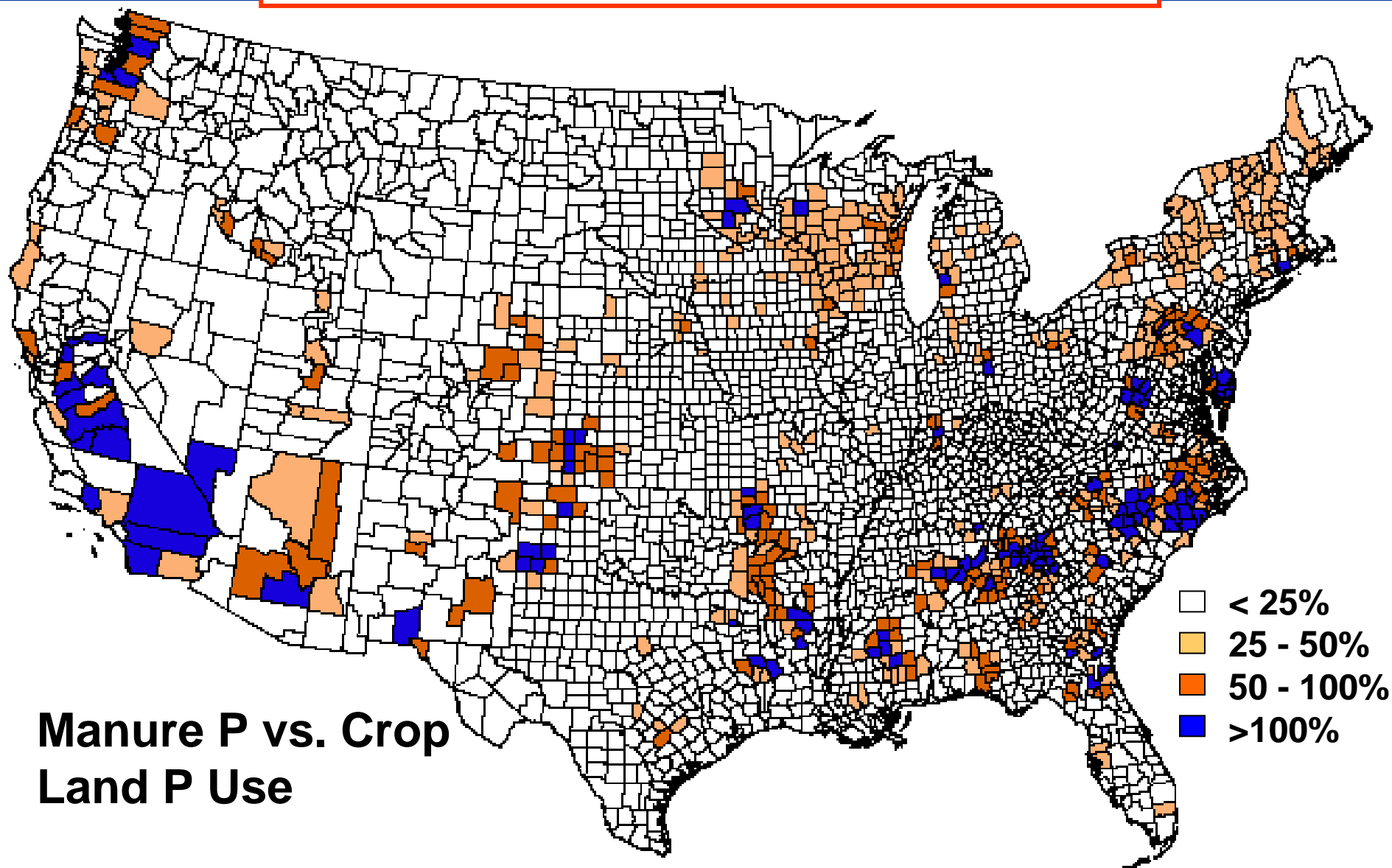


Nutrient Concentration

- Regional nutrient concentration issues



*Do we live in region of
regional nutrient concentration?*

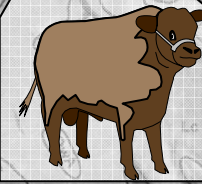


**Manure P vs. Crop
Land P Use**

Nutrient Concentration

- Regional nutrient concentration issues
- Individual farm nutrient concentration issues





Nutrient Concentration

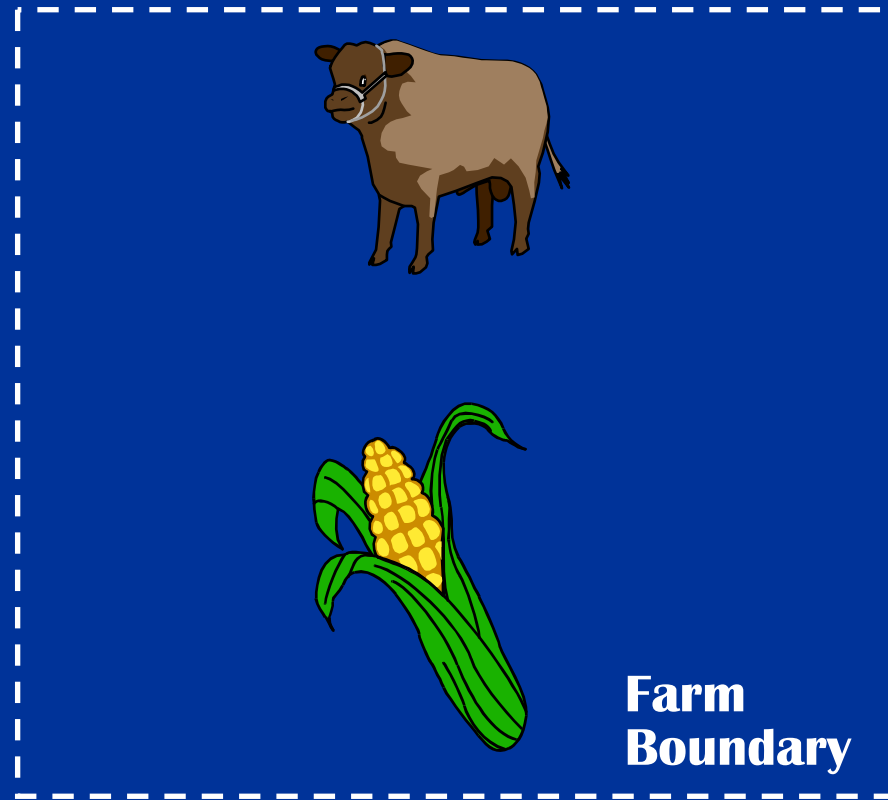
- Regional nutrient concentration issues
- Individual farm nutrient concentration issues.
- Single field nutrient concentration issues.



What is “Whole Farm” Nutrient Balance

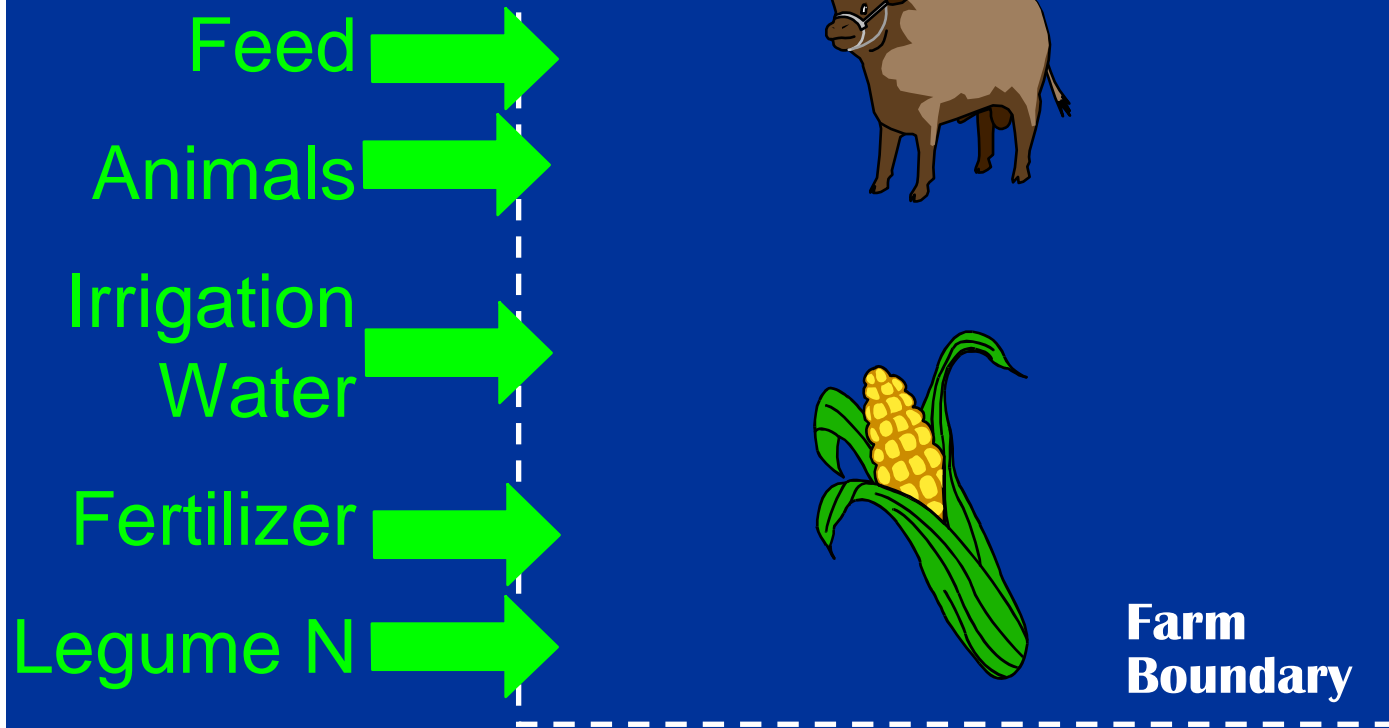


Nutrient Flows on Livestock Farms



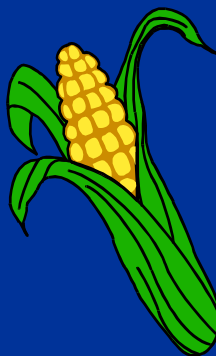
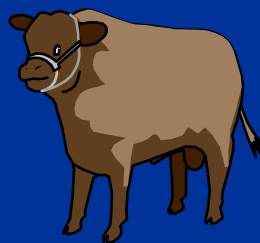
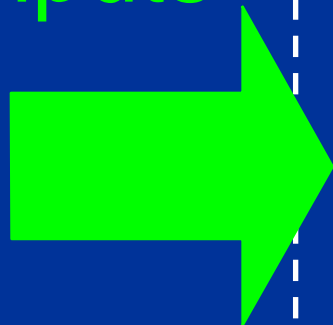
Nutrient Inputs

Inputs



Managed Nutrient Outputs

Inputs



Farm
Boundary

Managed
Outputs



Meat &
Milk



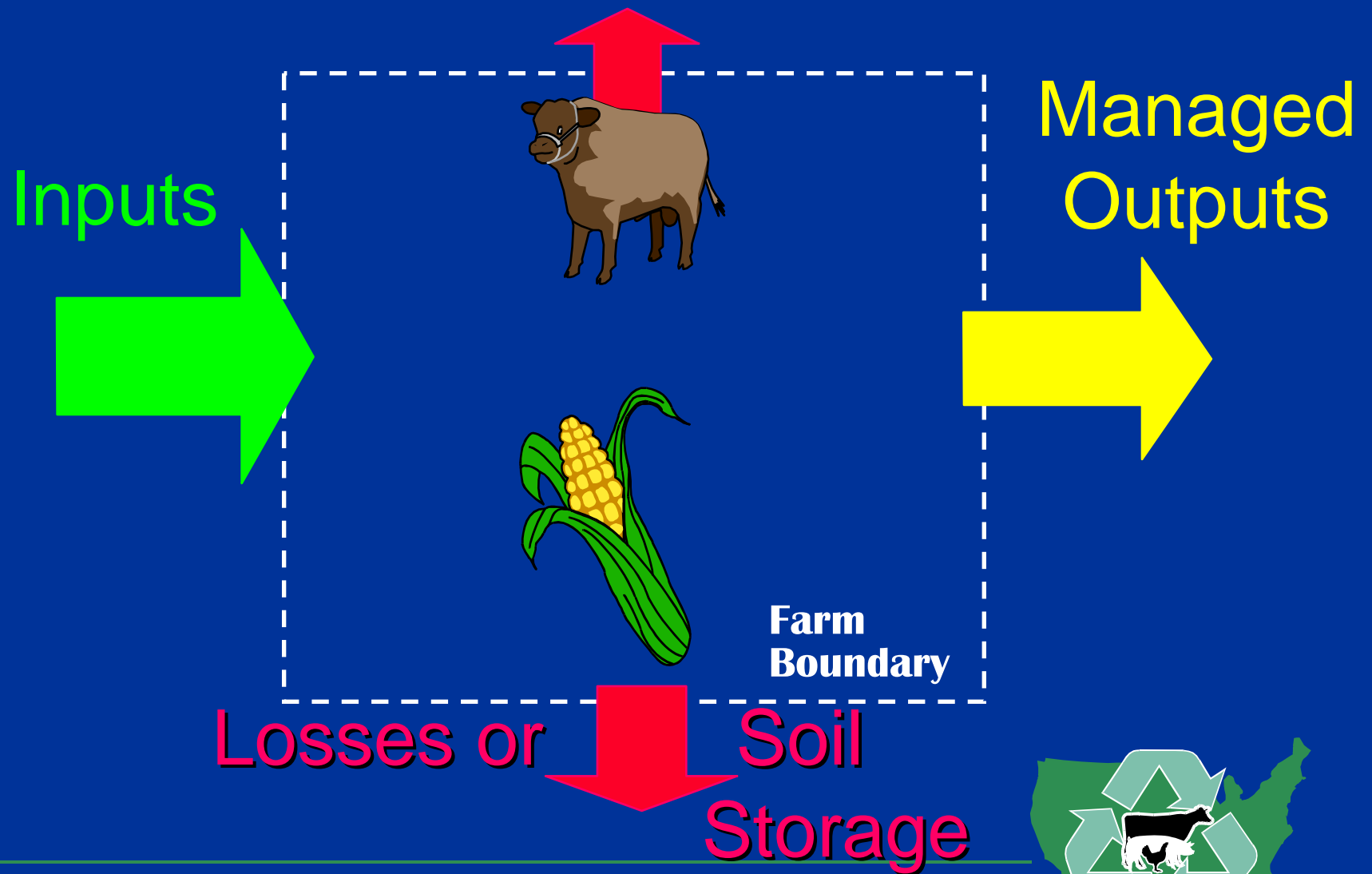
Crops



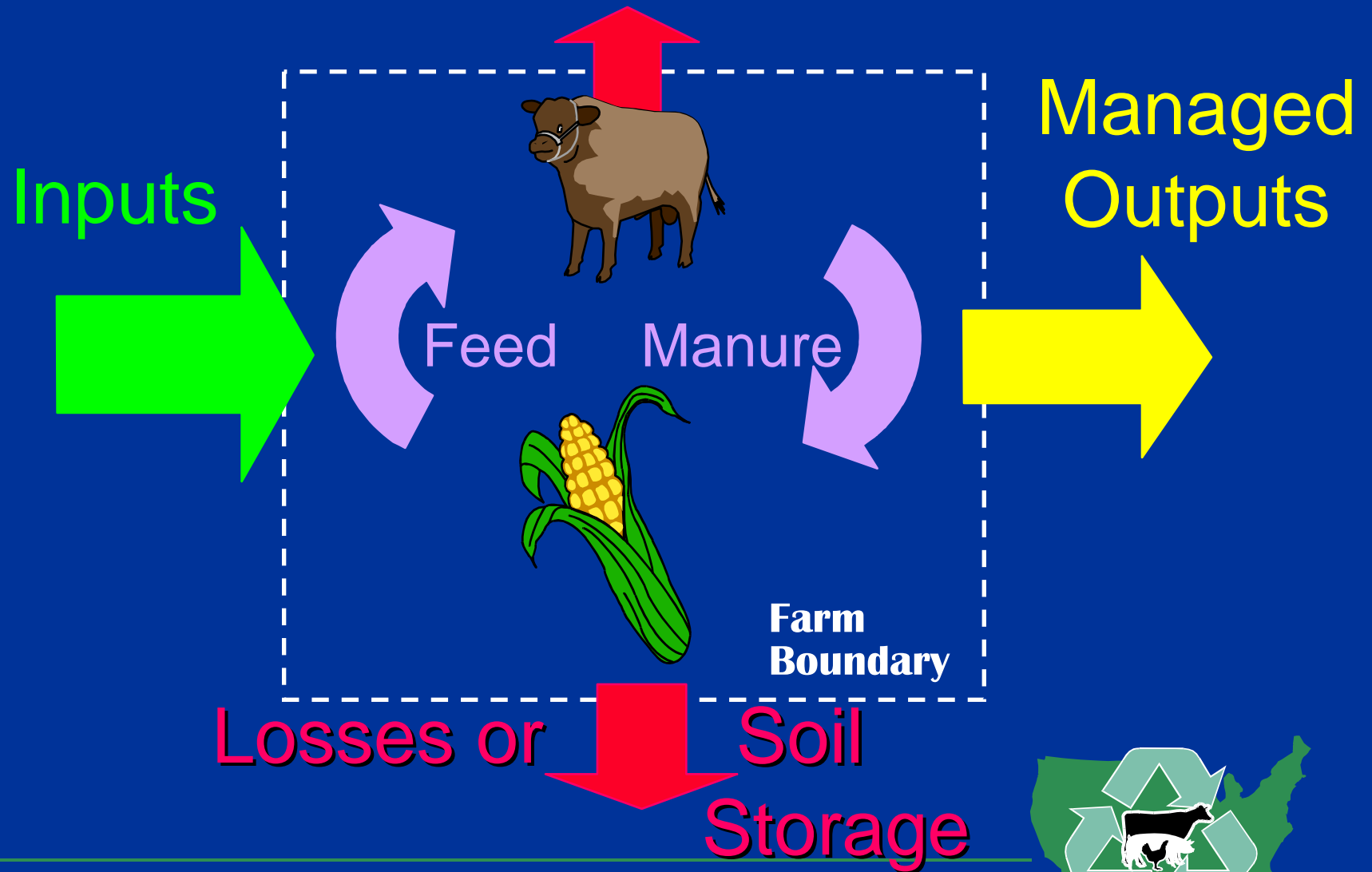
Manure



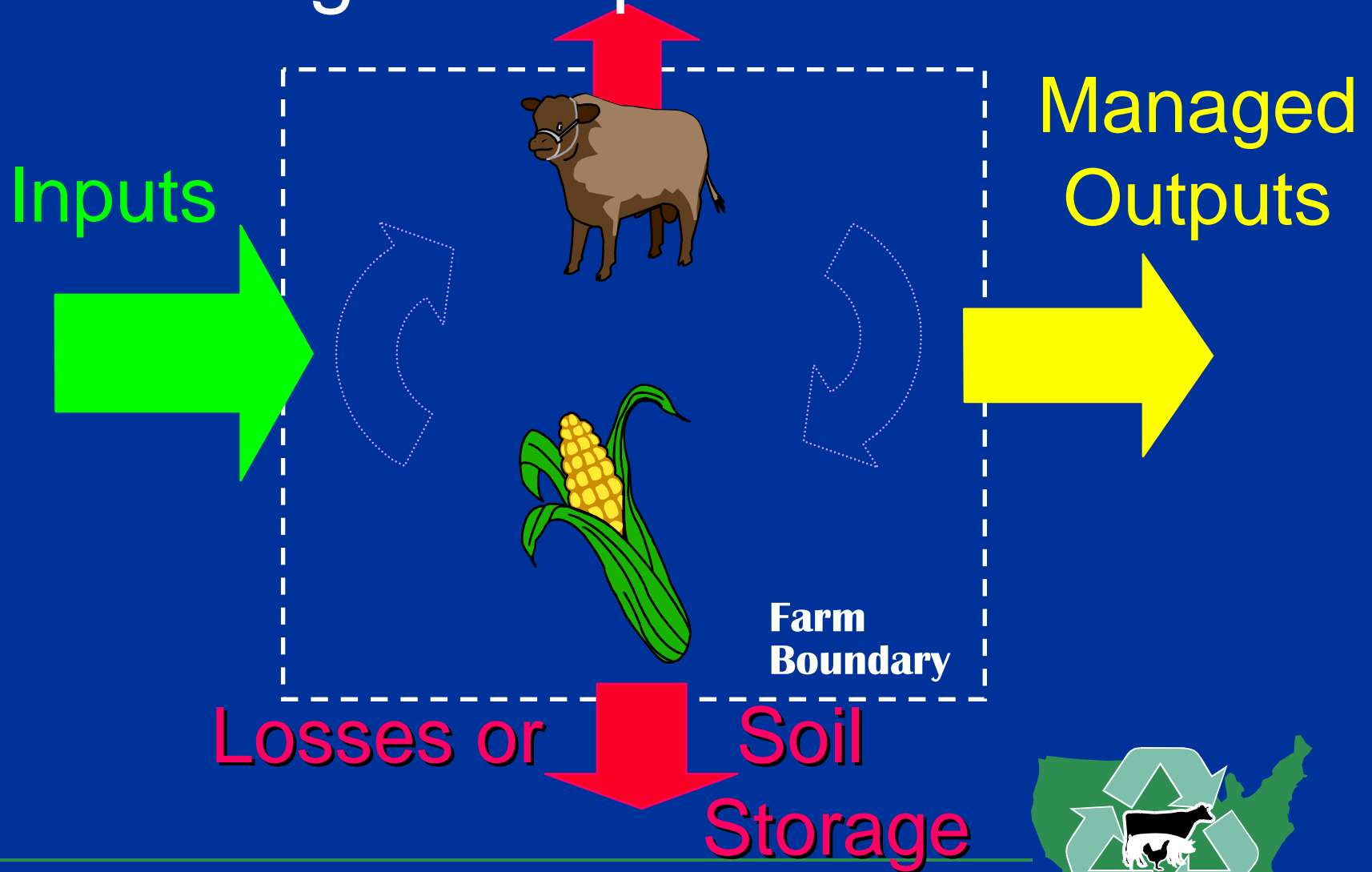
Losses & Soil Storage



Recycling of Nutrients



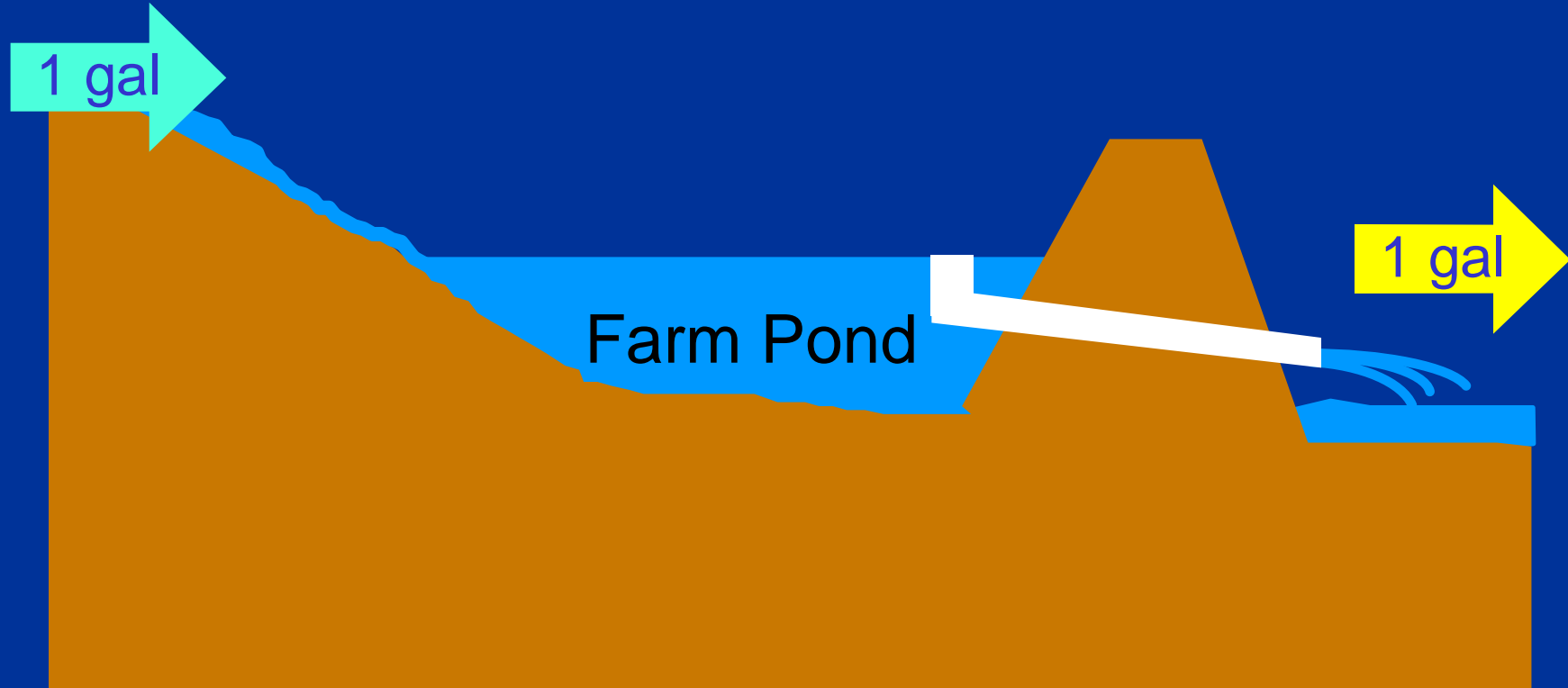
Are Nutrient Inputs & Managed Outputs in Balance?



Are Nutrient Inputs & Outputs In Balance?

Water In

Water Out



Are Nutrient Inputs & Outputs In Balance?

Water In

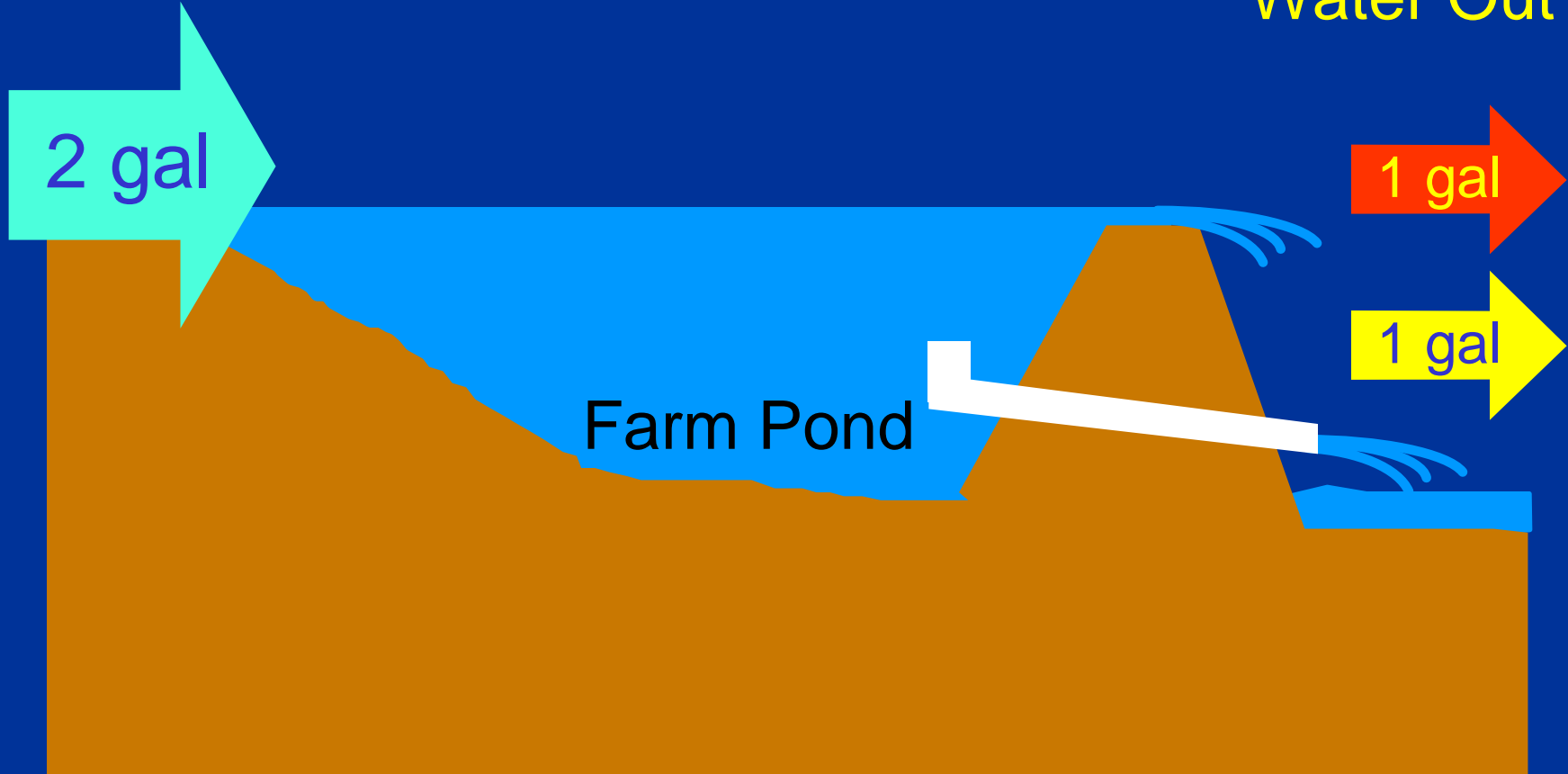
2 gal

Water Out

1 gal

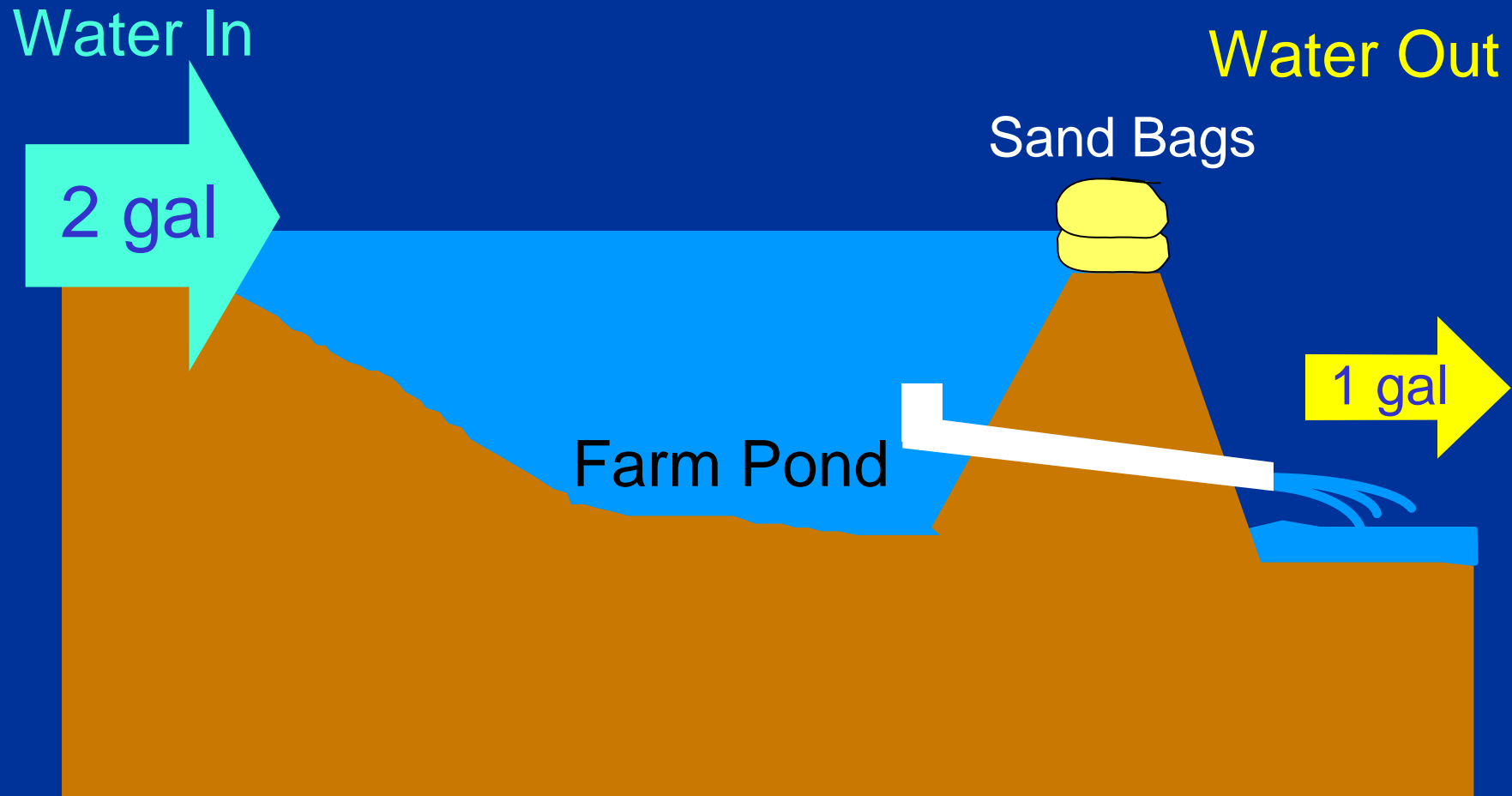
1 gal

Farm Pond



Plugging the Leaks . . .

Temporary Solution to Imbalance



Sustainable Solutions Must Correct the Imbalance!

Water In

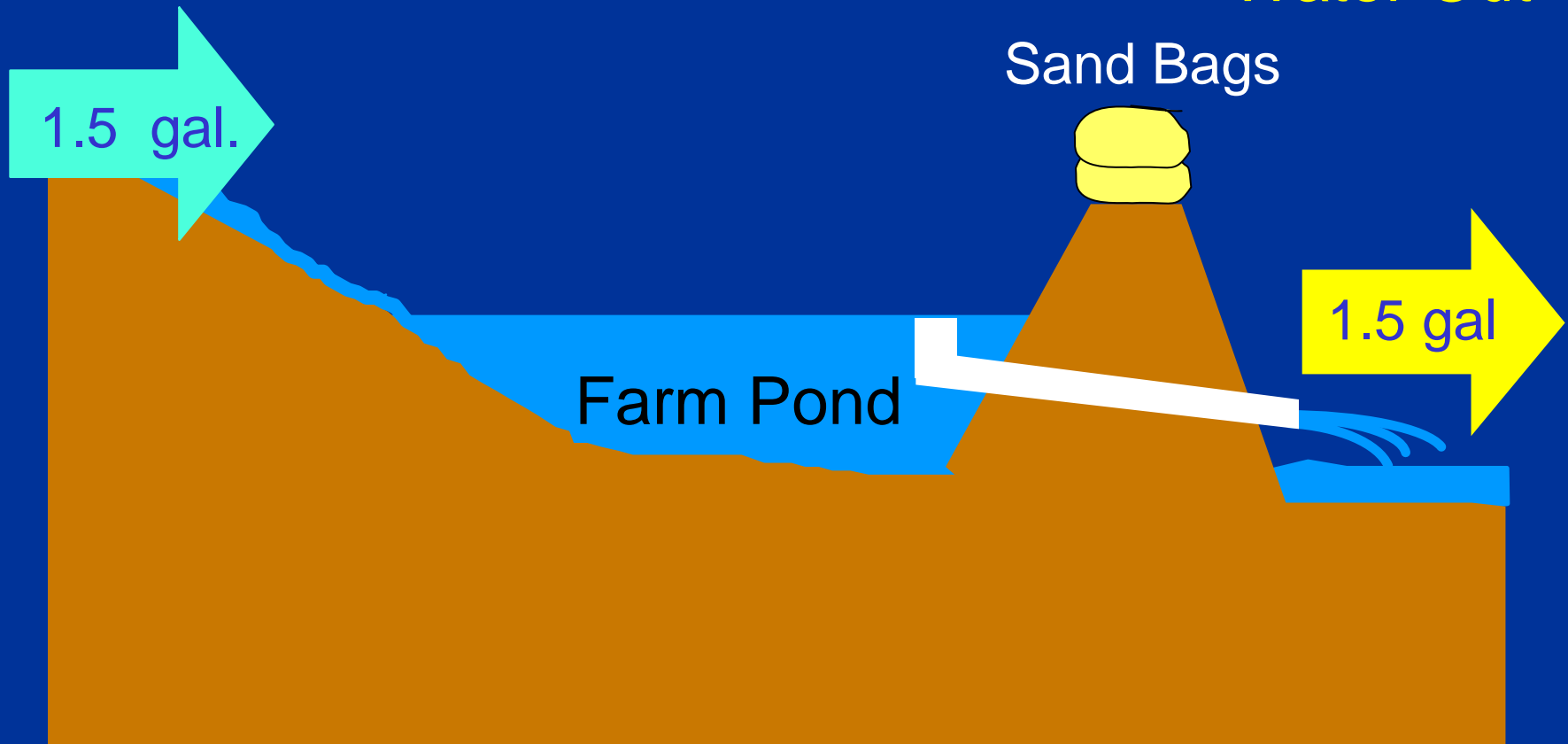
1.5 gal.

Water Out

Sand Bags

1.5 gal

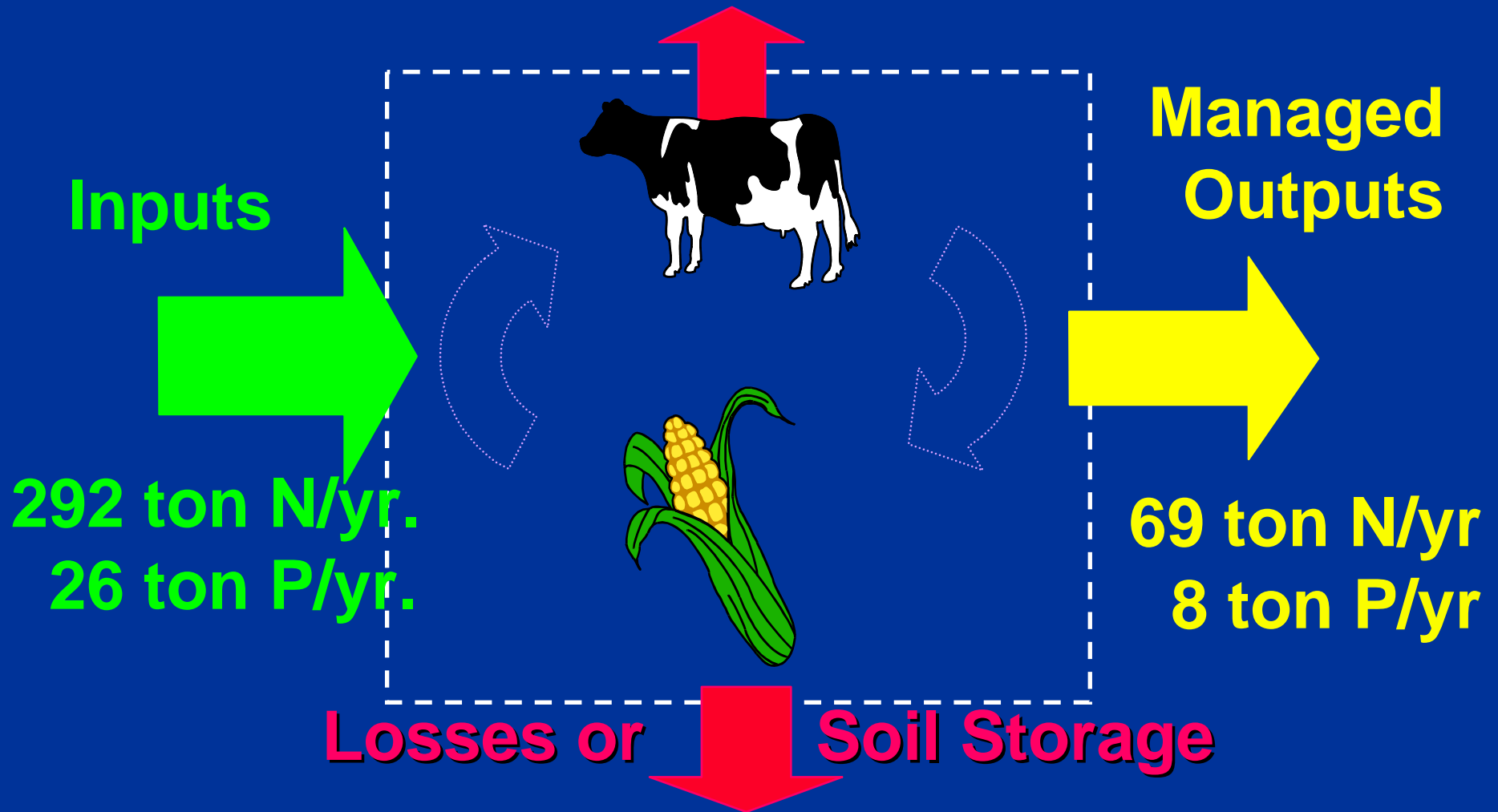
Farm Pond



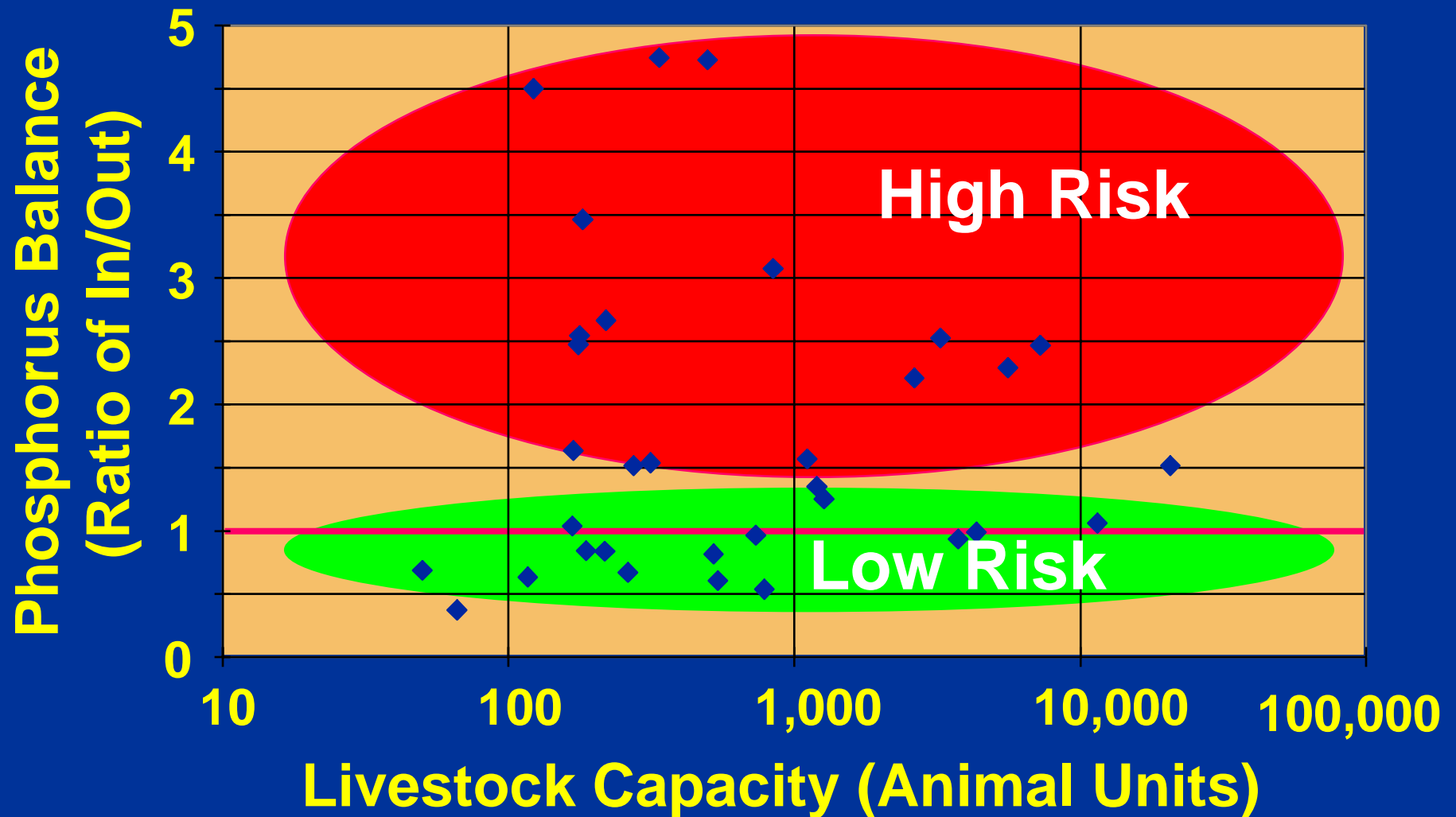
Typical Nutrient Balance on AFO's



Are Inputs & Outputs Out of Balance? (1200 cow dairy)



Livestock Capacity vs P Balance



Phosphorus Inputs to Livestock Systems

Phosphorus Inputs (% of Total)

Fertilizer

Feeds

Animals

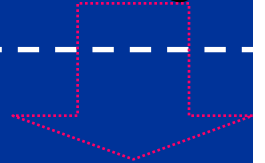
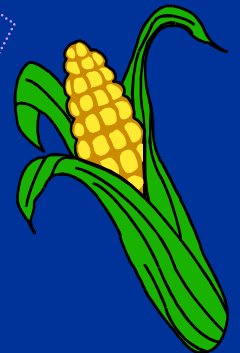
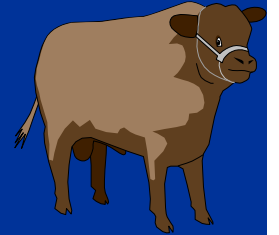
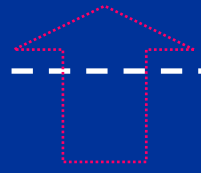
Which P input is largest?

<250

250-2500

>2500

One Time Animal Capacity (animal units)



Phosphorus Inputs to Livestock Systems

Phosphorus Inputs (% of Total)

Fertilizer

35%

Feeds

62%

Animals

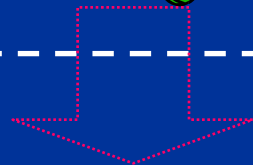
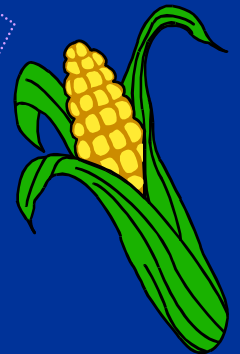
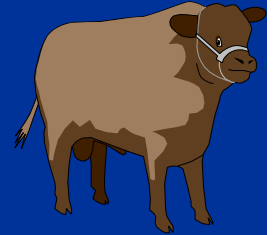
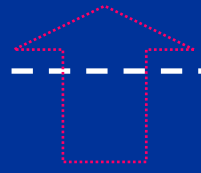
3%

<250

250-2500

>2500

One Time Animal Capacity (animal units)



Phosphorus Inputs to Livestock Systems

Phosphorus Inputs (% of Total)

Fertilizer

35%

33%

Feeds

62%

47%

Animals

3%

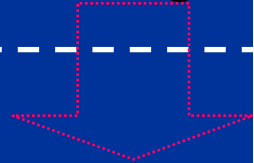
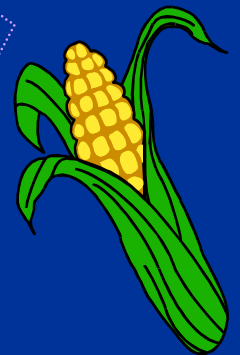
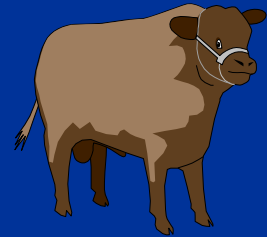
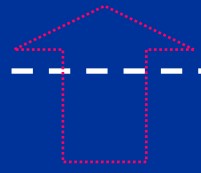
20%

<250

250-2500

>2500

One Time Animal Capacity (animal units)



Phosphorus Inputs to Livestock Systems

Phosphorus Inputs (% of Total)

Fertilizer

35%

33%

1%

Feeds

62%

47%

74%

Animals

3%

20%

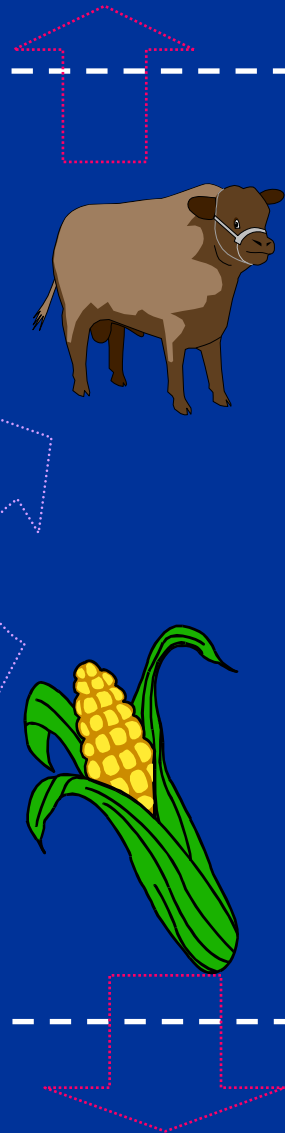
25%

<250

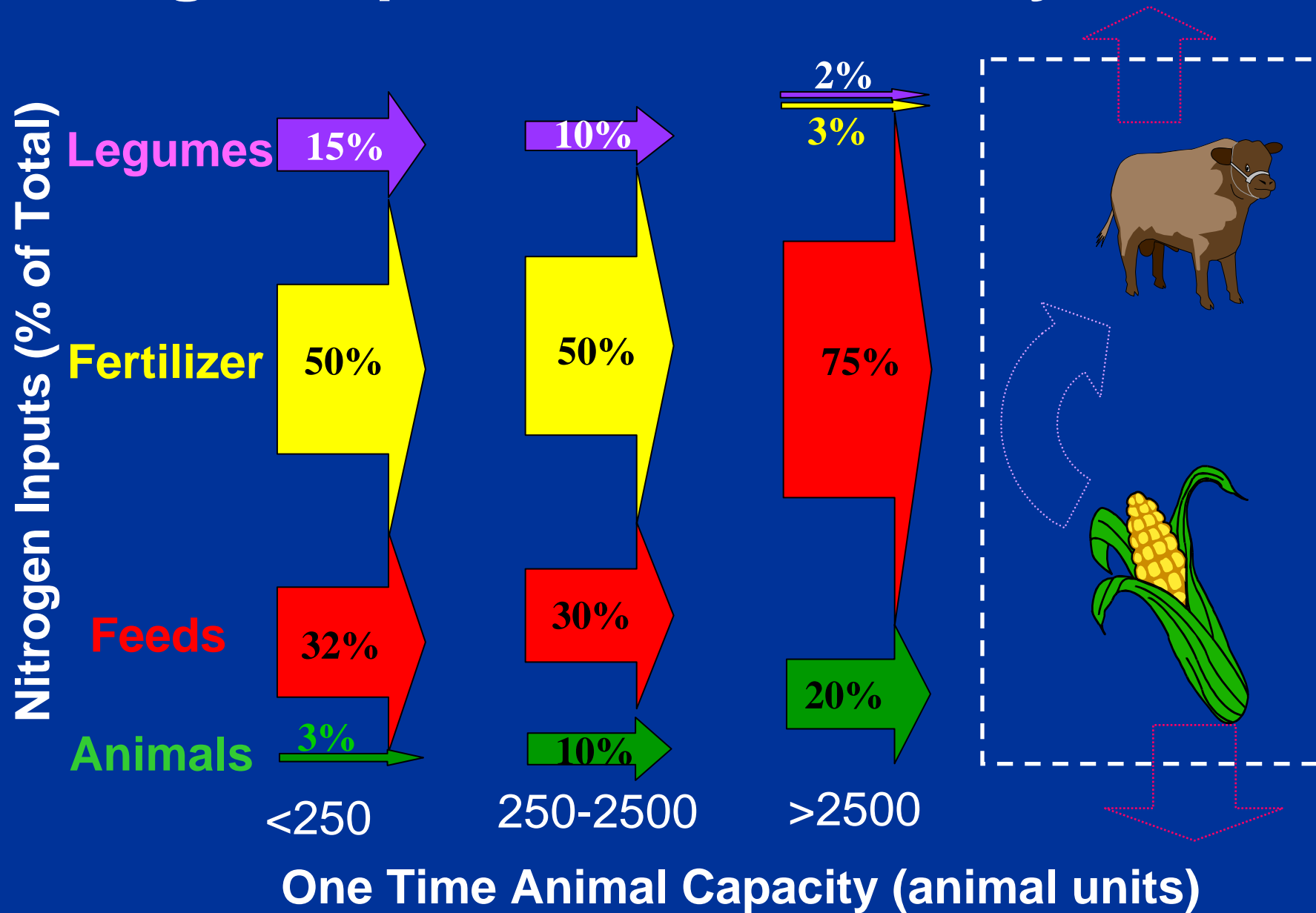
250-2500

>2500

One Time Animal Capacity (animal units)



Nitrogen Inputs to Livestock Systems



Are Nutrients “Out Of Balance” On My Animal Feeding Operation?



Indicators of Nutrient Imbalance

<u>Yes</u>	<u>No</u>	<u>Indicator</u>
_____	_____	Soil P increasing with time?
_____	_____	High soil P levels?
_____	_____	Majority of feed protein and P comes from off-farm sources?
_____	_____	Feed rations exceed NRC or university recommendations
_____	_____	No nutrient plan for manure?
_____	_____	< 1 acre per animal unit

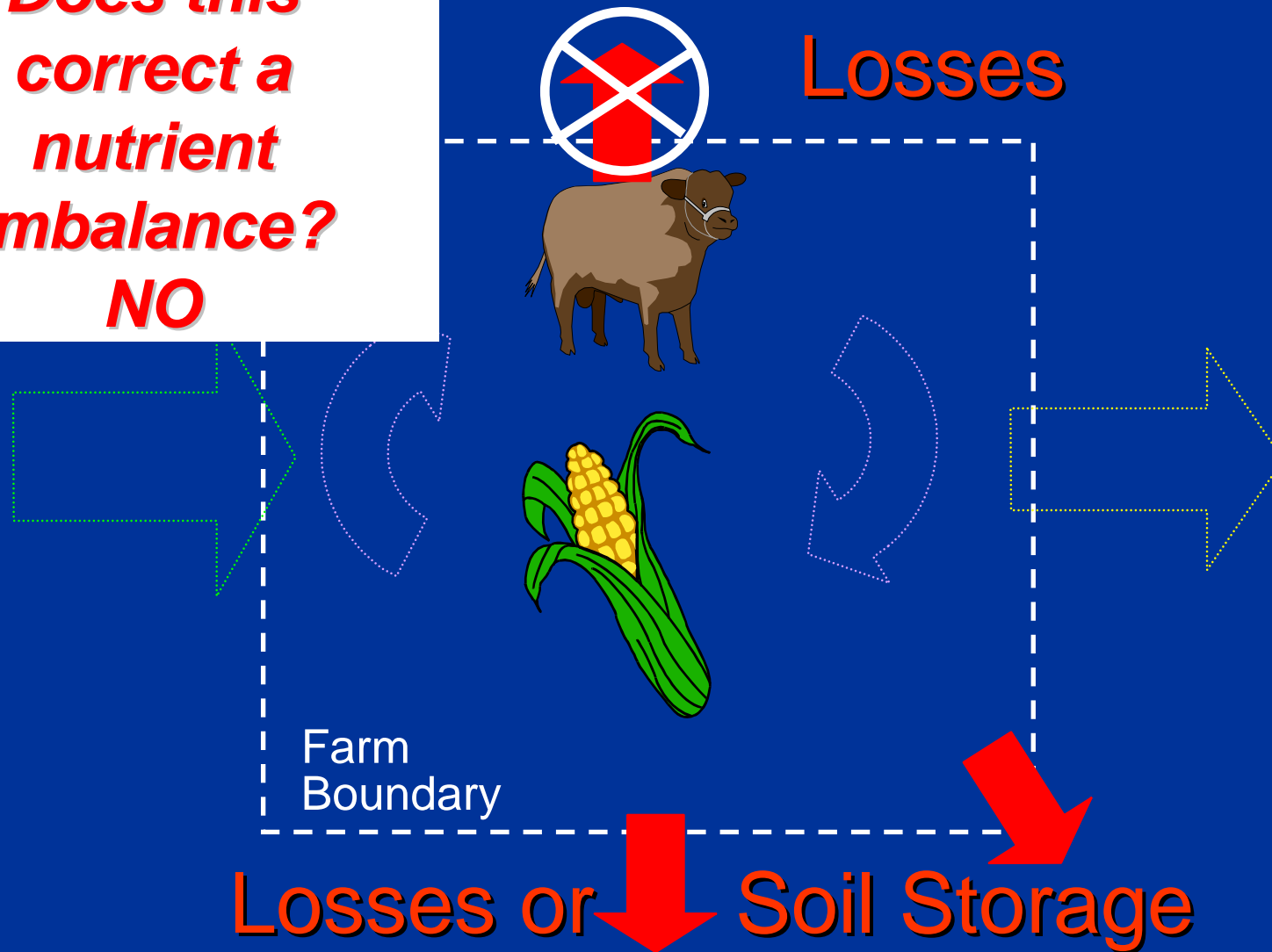




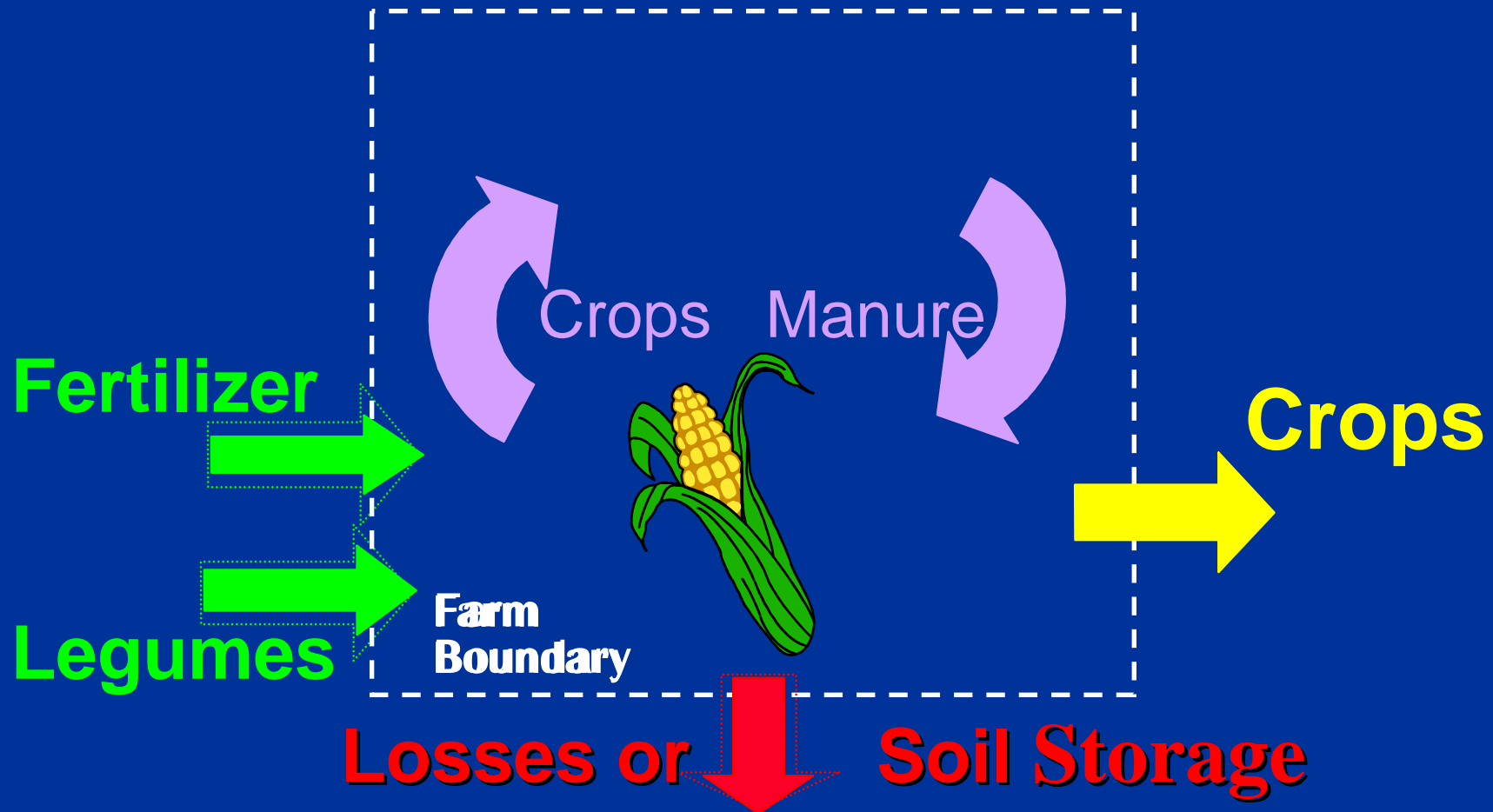
What are Appropriate Strategies for Managing Nutrient Imbalances?

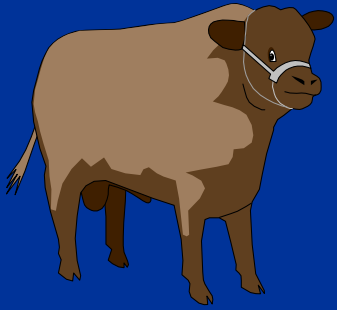


***Does this
correct a
nutrient
imbalance?
NO***



Sustainable Strategy No.1: Credit Manure Nutrients in Crops



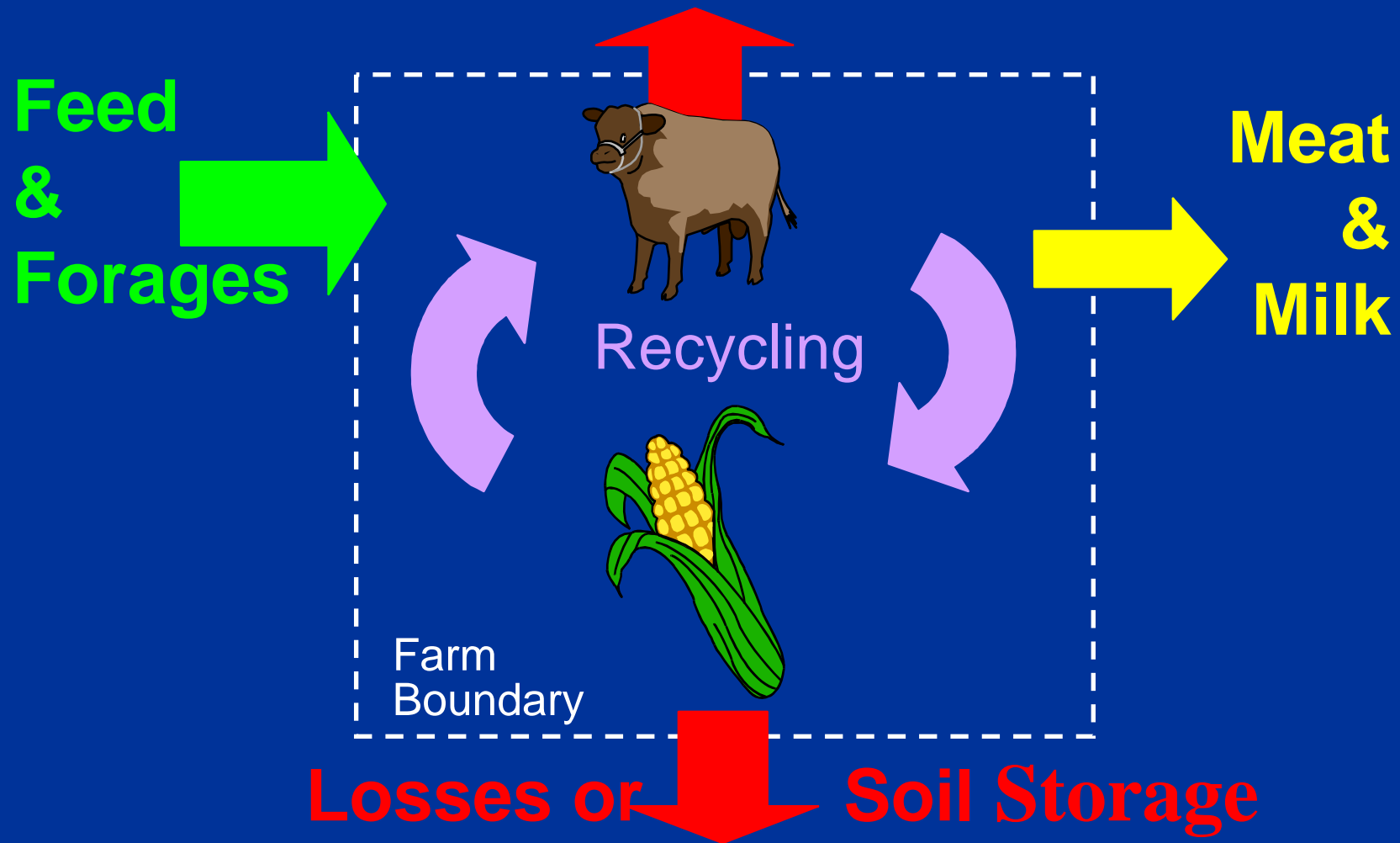


Cropping System N Balance

Farm #	1	2	
Acres/AU	1.7	0.4	
<hr/>			
N Inputs			
Manure	25	208	t/yr
Fertilizer	59	37	t/yr
Legume N	4	21	t/yr
N Output	51	111	t/yr
Imbalance	27	155	t/yr

*Will efficient use of manure to replace
commercial fertilizer correct the
imbalance?*

Sustainable Strategy No. 2: Reducing Feed Inputs



Influence of By-Products of Corn Processing on Nutrient Imbalance

(16 feedlots)

N Balance

P Balance

By-product used?

Yes

No



Influence of By-Products of Corn Processing on Nutrient Imbalance

(16 feedlots)

N Balance

P Balance

By-product used?

Yes **2.6 to 1**

No **2.5 to 1**



Influence of By-Products of Corn Processing on Nutrient Imbalance

(16 feedlots)

N Balance

P Balance

By-product used?

Yes

2.6 to 1

2 to 1

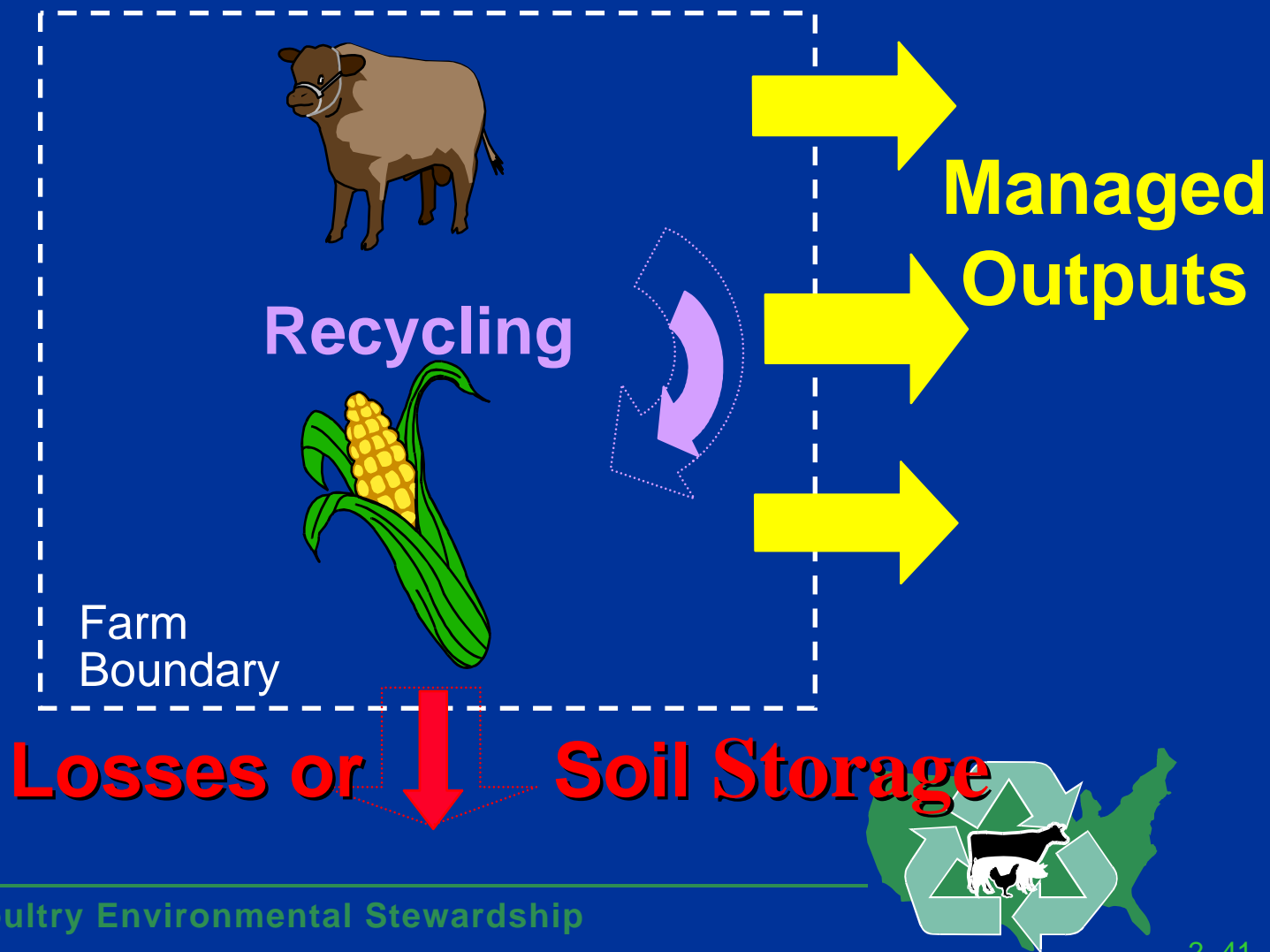
No

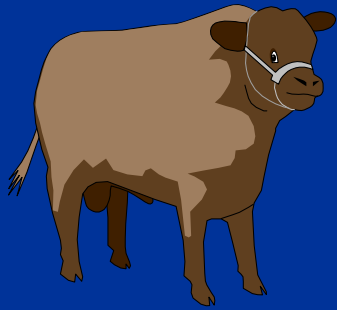
2.5 to 1

1.1 to 1



Sustainable Strategy No. 3: Move Manure Nutrients Off Farm





Phosphorus Imbalance Resulting from Manure Marketing

<u>Animal Units:</u>	<u>4,300</u>	<u>11,500</u>	<u>21,000</u>
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**No Manure
Marketed**

4.2 to 1

2.0 to 1

2.6 to 1

**Current
Marketing
Effort**

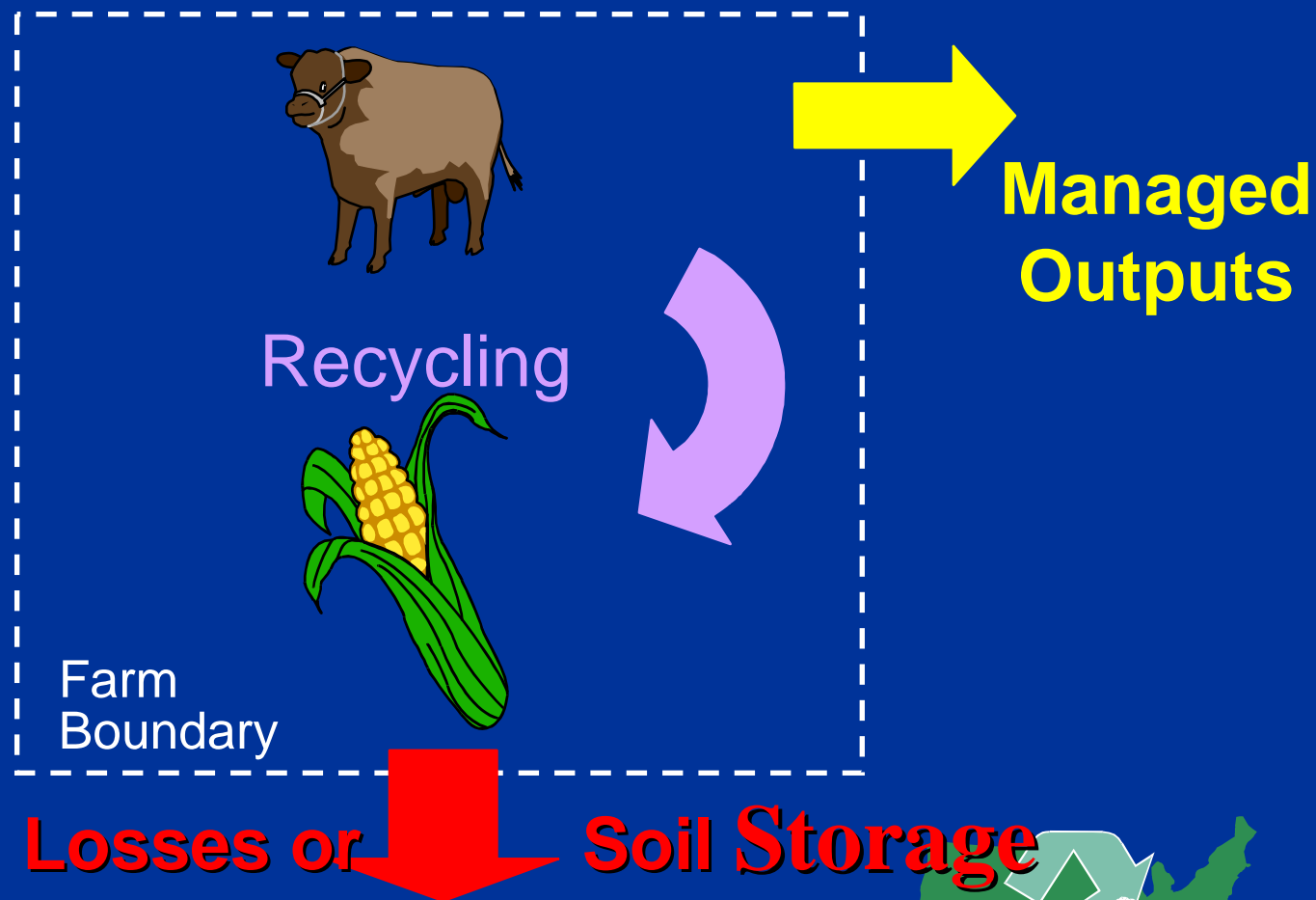
1 to 1

1.1 to 1

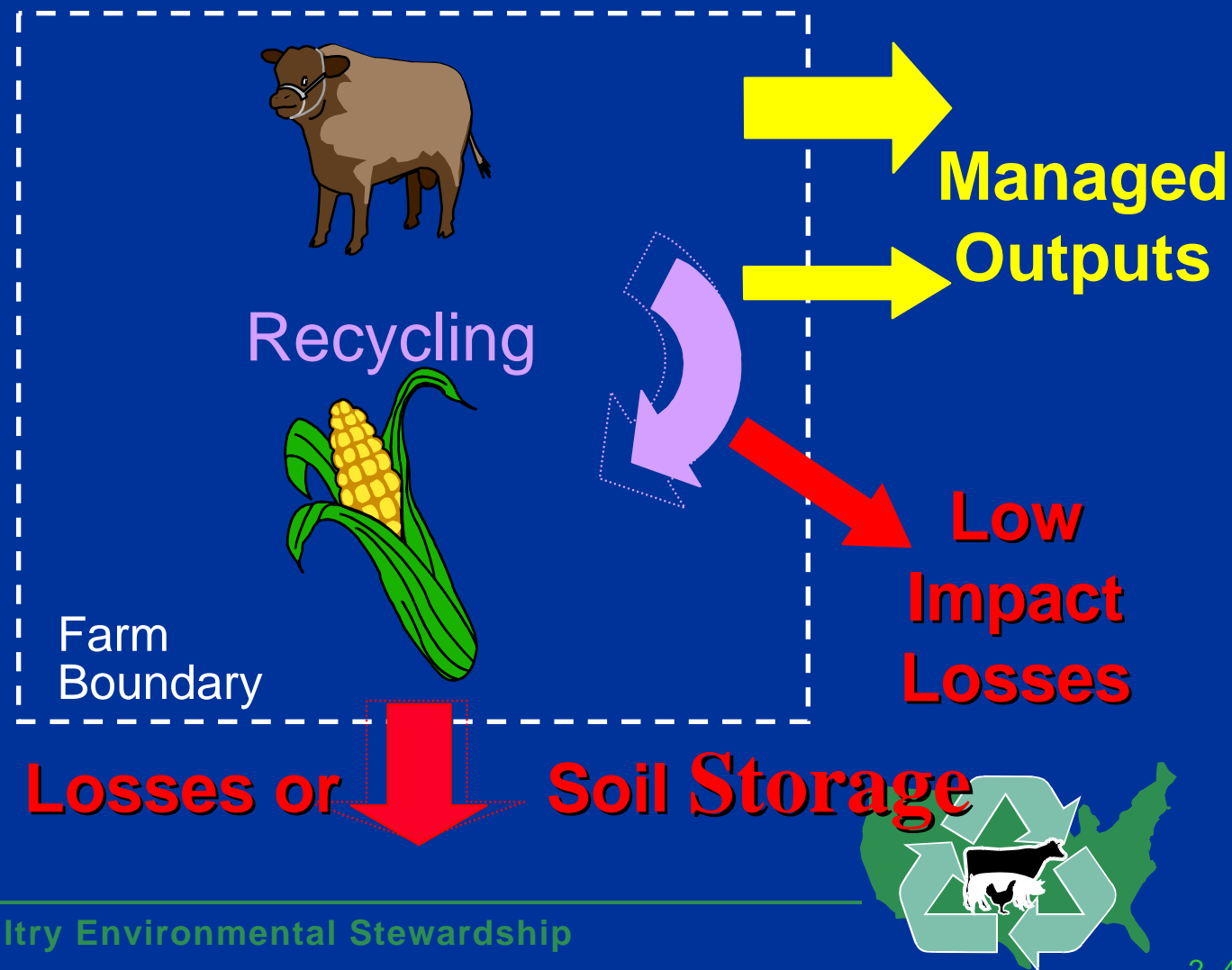
1.5 to 1



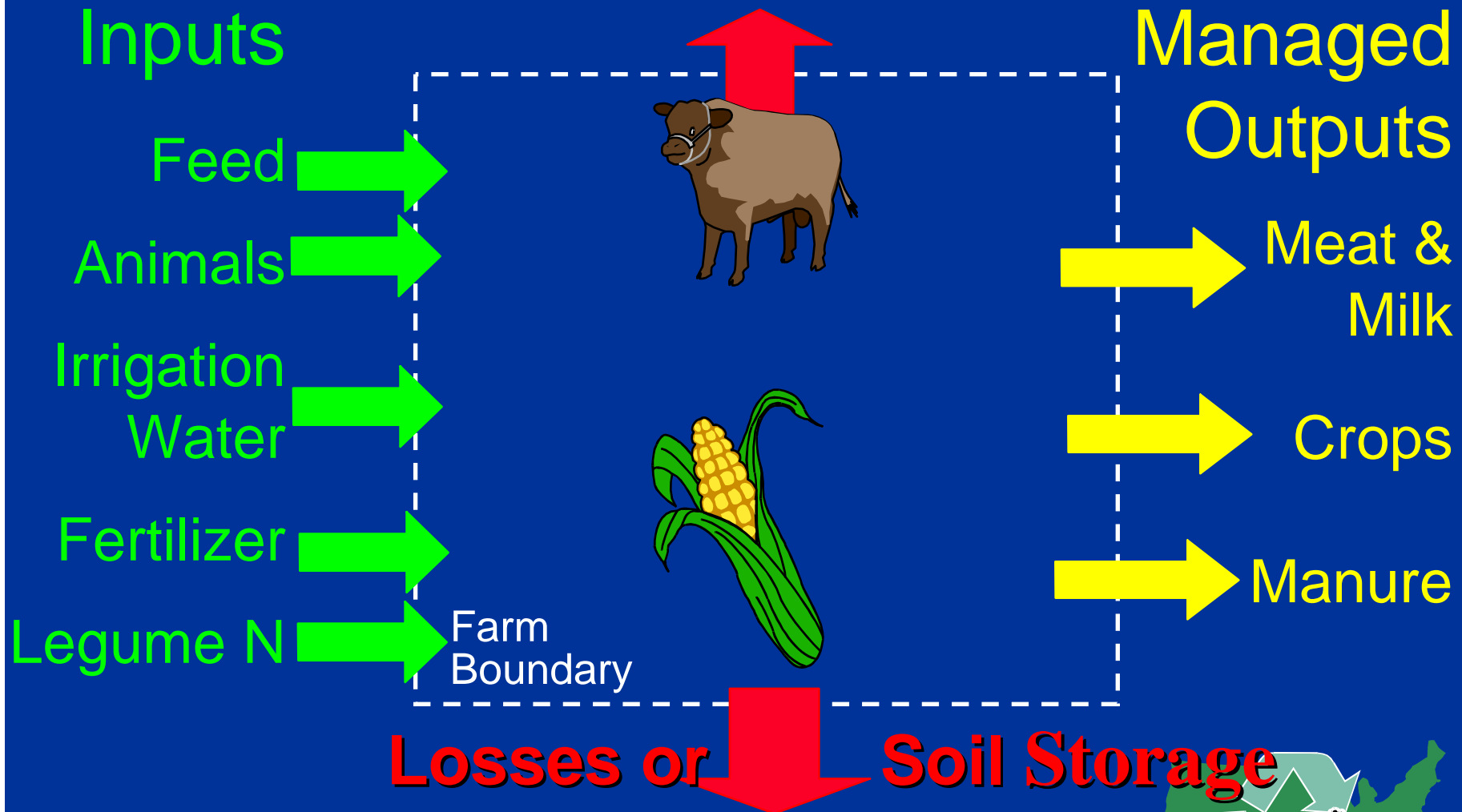
Sustainable Strategy No. 4: Manure Treatment



Sustainable Strategy No. 4: Manure Treatment



Nutrient Balance



Managing Nutrients with CNMP's



Livestock and Poultry Environmental Stewardship



Importance of CNMP's

“EPA, working jointly with USDA NRCS, has determined that the most effective way for all AFO's to minimize water quality and public health risks is to develop and implement ... Comprehensive Nutrient Management Plans.”

**US EPA Guidance Manual for NPDES Permit for
Concentrated Animal Feeding Operations**



What Is a CNMP?

- Environmental “Operating Plan” for AFO
- Nutrient plan for “Whole Farm” and individual component (e.g. crop nutrient plan)
- Integrate nutrient plan with other issues (e.g. soil conservation and odor)
- Environmental record keeping system



What is Included in a CNMP?

- Manure handling and storage plan
- Land application plan
- Site management plan
- Record keeping
- Alternative manure use plan
- Feed management plan



Assessing Your Compliance With Environmental Regulations



Livestock and Poultry Environmental Stewardship



Agencies Involved in Regulating Nutrient Issues

Federal

- U.S. Environmental Protection Agency

State

- NM Environment Department
 - Surface Water Quality
 - Ground Water Quality



Take Home Message



Livestock and Poultry Environmental Stewardship



Take Home Message

- “Whole Farm” nutrient balance defines the magnitude of nutrient related risks.
- Many AFO’s exhibit nutrient imbalance.
- Nutrient strategies must address nutrient imbalance
- A CNMP will be the operating plan for nutrient planning.



Thank-you



Livestock and Poultry Environmental Stewardship

